

Flexion (degrees)	Force (± 6 pounds)
20	28
30	40
40	52

(c) Test procedure: (1) Assemble the thorax, lumbar spine, pelvic, and upper leg assemblies (above the femur force transducers), ensuring that all component surfaces are clean, dry, and untreated unless otherwise specified, and attach them to the horizontal fixture shown in Figure 5 at the two link rod pins and with the mounting brackets for the lumbar test fixtures illustrated in Figures 6 to 9.

(2) Attach the rear mounting of the pelvis to the pelvic instrument cavity rear face at the four $\frac{1}{4}$ " cap screw holes and attach the front mounting at the femur axial rotation joint. Tighten the mountings so that the pelvic-lumbar adapter is horizontal and adjust the femur friction plungers at each hip socket joint to 240 inch-pounds torque.

(3) Flex the thorax forward 50° and then rearward as necessary to return it to its initial position in accordance with Figure 11 unsupported by external means.

(4) Apply a forward force perpendicular to the thorax instrument cavity rear face in the midsagittal plane 15 inches above the top surface of the pelvic-lumbar adapter. Apply the force at any torso deflection rate between .5 and 1.5 degrees per second up to 40° of flexion but no further, continue to apply for 10 seconds that force necessary to maintain 40° of flexion, and record the force with an instrument mounted to the thorax as shown in Figure 5. Release all force as rapidly as possible and measure the return angle 3 minutes after the release.

(d) When the abdomen is subjected to continuously applied force in accordance with paragraph (e) of this section, the abdominal force-deflection curve shall be within the two curves plotted in Figure 10.

(e) Test procedure: (1) Place the assembled thorax, lumbar spine and pelvic assemblies in a supine position on a flat, rigid, smooth, dry, clean horizontal surface, ensuring that all component surfaces are clean, dry, and untreated unless otherwise specified.

(2) Place a rigid cylinder 6 inches in diameter and 18 inches long transversely across the abdomen, so that the cylinder is symmetrical about the midsagittal plane, with its longitudinal centerline horizontal and perpendicular to the midsagittal plane at a point 9.2 inches above the bottom line of the buttocks, measured with the dummy positioned in accordance with Figure 11.

(3) Establish the zero deflection point as the point at which a force of 10 pounds has been reached.

(4) Apply a vertical downward force through the cylinder at any rate between 0.25 and 0.35 inches per second.

(5) Guide the cylinder so that it moves without significant lateral or rotational movement.

[42 FR 7152, Feb. 7, 1977]

§ 572.10 Limbs.

(a) The limbs consist of the assemblies shown as numbers SA 150 M070, SA 150 M071, SA 150 M080, and SA 150 M081 in Figure 1 and conform to the drawings subtended by these numbers.

(b) When each knee is impacted at 6.9 ft/sec. in accordance with paragraph (c) of this section, the maximum force on the femur shall be not more than 2500 pounds and not less than 1850 pounds, with a duration above 1000 pounds of not less than 1.7 milliseconds.

(c) Test procedure: (1) Seat the dummy without back support on a surface as specified in § 572.11(i) that is 17.3 ± 0.2 inches above a horizontal surface, oriented as specified in § 572.11(i), and with the hip joint adjustment at any setting between 1g and 2g. Place the dummy legs in planes parallel to its midsagittal plane (knee pivot centerline perpendicular to the midsagittal plane) and with the feet flat on the horizontal surface. Adjust the feet and lower legs until the lines between the midpoints of the knee pivots and the ankle pivots are at any angle not less than 2 degrees and not more than 4 degrees rear of the vertical, measured at the centerline of the knee pivots.

(2) Reposition the dummy if necessary so that the rearmost point of the lower legs at the level one inch below the seating surface remains at any distance not less than 5 inches and

§572.11

49 CFR Ch. V (10–1–03 Edition)

not more than 6 inches forward of the forward edge of the seat.

(3) Align the test probe specified in §572.11(a) so that at impact its longitudinal centerline coincides within $\pm 2^\circ$ with the longitudinal centerline of the femur.

(4) Impact the knee with the test probe moving horizontally and parallel to the midsagittal plane at the specified velocity.

(5) Guide the probe during impact so that it moves with no significant lateral, vertical, or rotational movement.

[38 FR 20451, Aug. 1, 1973, as amended at 42 FR 7153, Feb. 7, 1977]

§572.11 Test conditions and instrumentation.

(a) The test probe used for thoracic and knee impact tests is a cylinder 6 inches in diameter that weighs 51.5 pounds including instrumentation. Its impacting end has a flat right face that is rigid and that has an edge radius of 0.5 inches.

(b) Accelerometers are mounted in the head on the horizontal transverse bulkhead shown in the drawings subreferenced under assembly No. SA 150 M010 in Figure 1, so that their sensitive axes intersect at a point in the midsagittal plane 0.5 inches above the horizontal bulkhead and 1.9 inches ventral of the vertical mating surface of the skull with the skull cover. One accelerometer is aligned with its sensitive axis perpendicular to the horizontal bulkhead in the midsagittal plane and with its seismic mass center at any distance up to 0.3 inches superior to the axial intersection point. Another accelerometer is aligned with its sensitive axis parallel to the horizontal bulkhead and perpendicular to the midsagittal plane, and with its seismic mass center at any distance up to 1.3 inches to the left of the axial intersection point (left side of dummy is the same as that of man). A third accelerometer is aligned with its sensitive axis parallel to the horizontal bulkhead in the midsagittal plane, and with its seismic mass center at any distance up to 1.3 inches dorsal to the axial intersection point.

(c) Accelerometers are mounted in the thorax by means of a bracket attached to the rear vertical surface

(hereafter “attachment surface”) of the thoracic spine so that their sensitive axes intersect at a point in the midsagittal plane 0.8 inches below the upper surface of the plate to which the neck mounting bracket is attached and 3.2 inches perpendicularly forward of the surface to which the accelerometer bracket is attached. One accelerometer has its sensitive axis oriented parallel to the attachment surface in the midsagittal plane, with its seismic mass center at any distance up to 1.3 inches inferior to the intersection of the sensitive axes specified above. Another accelerometer has its sensitive axis oriented parallel to the attachment surface and perpendicular to the midsagittal plane, with its seismic mass center at any distance up to 0.2 inches to the right of the intersection of the sensitive axes specified above. A third accelerometer has its sensitive axis oriented perpendicular to the attachment surface in the midsagittal plane, with its seismic mass center at any distance up to 1.3 inches dorsal to the intersection of the sensitive axes specified above. Accelerometers are oriented with the dummy in the position specified in §572.11(i).

(d) A force-sensing device is mounted axially in each femur shaft so that the transverse centerline of the sensing element is 4.25 inches from the knee’s center of rotation.

(e) The outputs of acceleration and force-sensing devices installed in the dummy and in the test apparatus specified by this part are recorded in individual data channels that conform to the requirements of SAE Recommended Practice J211a, December 1971, with channel classes as follows:

- (1) Head acceleration—Class 1000.
- (2) Pendulum acceleration—Class 60.
- (3) Thorax acceleration—Class 180.
- (4) Thorax compression—Class 180.
- (5) Femur force—Class 600.

(f) The mountings for sensing devices have no resonance frequency within a range of 3 times the frequency range of the applicable channel class.

(g) Limb joints are set at 1g, barely restraining the weight of the limb when it is extended horizontally. The force required to move a limb segment does not exceed 2g throughout the range of limb motion.